

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC**

In the Matters of)	
)	
International Comparison and)	GN Docket No. 09-47
Survey Requirements in the)	
Broadband Data Improvement Act)	
)	
A National Broadband Plan for Our Future)	GN Docket No. 09-51
)	
Inquiry Concerning the Deployment of Advanced)	GN Docket No. 09-137
Telecommunications Capability to All Americans)	
in a Reasonable and Timely Fashion, and Possible)	
Steps to Accelerate Such Deployment Pursuant to)	
Section 706 of the Telecommunications Act of)	
1996, as Amended by the Broadband Data)	
Improvement Act)	

**COMMENTS OF THE FIBER-TO-THE-HOME COUNCIL
NBP PUBLIC NOTICE #1**

Thomas W. Cohen
Kelley Drye & Warren LLP
3050 K Street NW, Suite 400
Washington, DC 20007
(202) 342-8518 (telephone)
(202) 342-8451 (facsimile)
TCohen@kelleydrye.com

*Counsel to the Fiber-to-the-Home
Council*

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CSMG National Broadband Plan Targeted Research, August, 31 2009

SUMMARY

The Fiber-to-the-Home Council provides the following comments:

1. The definition of broadband should be based primarily on throughput (bandwidth or speed) but also should include other performance indicia, including latency, jitter, and contention.
2. Broadband performance should be measured on a per user basis for the entire end-to-end service and for the access link. It also would be valuable to measure middle mile capabilities. These measurements should be made at peak traffic periods for a specific duration during a month and repeated measurements at least quarterly.
3. The definition of broadband is relevant because it serves as a basis for an array of policy actions by the Commission and because it provides benchmarks for users, applications providers, and service providers to determine the price and quality of services that are being offered. The flaws with the Commission's pre-2008 definition – broadband includes every internet access service with bandwidth of more than 200 kbps – are twofold. First, the definition served only one of many policy aims -- to ensure all users received a minimal level of service (the problem of "unserved" users) – and it was no help to users seeking more than this minimum. As a result, the Commission effectively ignored other important objectives, including the needs of underserved users or those of users demanding higher-quality service, and it gave most users no ability to benchmark offerings since they were subscribing to broadband services with performance far above this minimal level. The second major problem with the definition is that it did not distinguish between broadband provided over the much different fixed and mobile access infrastructures.

In last year's order expanding its data collection for broadband services, the Commission began to remedy these problems by requiring providers to submit data based on a series of broadband "speed" tiers. The FTTH Council believes the Commission should build on this decision in creating a tiered definition of broadband that is easily understandable, can evolve over time, and is relevant for purposes of policy determinations. To that end, the Council proposes a four tier definition of broadband: current generation tiers for minimum, average (or most widely used), and maximum (highest performance) service offerings and a fourth tier for future generation services. For the current generation tiers, the Council provides, based on advertised offerings, current performance benchmarks (throughput only): minimum -- 768/384 Kbps; average – 9.1/1.7 Mbps; maximum – 101/20 Mbps. These benchmarks should evolve with the market and also should reflect other performance indicia.

4. The Commission should amend its Form 477 to collect and report annually data on the broadband characteristics and performance indicia discussed herein. These data and the Commission's analysis of that information should be used to update the three broadband tiers of the chart proposed in the Thresholds Section. In addition, the Commission should issue annually a notice to (1) examine the future network performance requirements in light of developing applications, which will provide support for performance criteria in a fourth, Future Generation, tier, and (2) inquire about the need to alter its methodology for defining broadband.

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**COMMENTS OF THE FIBER-TO-THE-HOME COUNCIL
NBP PUBLIC NOTICE #1**

The Fiber-to-the-Home Council ("FTTH Council"),¹ through its undersigned counsel,
hereby respectfully submits its comments to the Federal Communications Commission

¹ The FTTH Council is a non-profit organization established in 2001. Its mission is to educate the public and government officials about fiber-to-the-home ("FTTH") and to promote and accelerate FTTH deployment and the resulting quality of life enhancements FTTH networks make possible. The FTTH Council's members represent all areas of the broadband access industry, including telecommunications, computing, networking, system integration, engineering, and content-provider companies, as well as traditional service providers, utilities, and municipalities. As of today, the FTTH Council has more than 210 entities as members. A complete list of FTTH Council members can be found on the organization's website: <http://www.ftthcouncil.org>.

(“Commission”) in response to NBP Public Notice #1 (“*Commission Notice*”)² issued in the above-captioned proceedings.³ The FTTH Council appreciates the Commission’s quest to fashion a more precise and relevant definition and understanding of the term “broadband” to assist it in developing a National Broadband Plan. The Members of the FTTH Council in their capacities as service providers, equipment vendors, and content/applications suppliers regularly wrestle with this term and have given considerable thought to its meaning, which is reflected in the responses that follow. Overall, as the Commission understands, broadband performance and use continue to evolve rapidly as applications place increasingly greater, and often novel, demands on networks and as providers upgrade their infrastructure in response. Any definition of broadband must account for this dynamic, and, as part of this proceeding, the Commission should establish a process that will enable it to amend the definition to keep pace with these market developments.

1. Form, Characteristics, and Performance Indicators

a. Form of Broadband Definition – Broadband should be viewed in terms of its capabilities, that is what users and application providers at the ends of the network require and what service providers supply. To date, the Commission and most private parties, including the FTTH Council, have viewed these capabilities solely in terms of downstream and upstream

² *Public Notice, Comment Sought on Defining “Broadband” NBP Public Notice #1*, Rel. Aug. 20, 2009.

³ *In the Matters of International Comparison and Survey Requirements in the Broadband Data Improvement Act*, GN Docket No. 09-47, Rel. Mar. 31, 2009, *A National Broadband Plan for Our Future*, GN Docket No. 09-51, Rel. Apr. 8, 2009 (“*NBP Notice of Inquiry*”), and *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, GN Docket No. 09-137, Rel. Aug. 7, 2009.

throughput (bandwidth or speed), and throughput continues to be the crucial indicator of network performance. In fact, in networks with the greatest capacity (*e.g.* all-fiber networks), the importance of throughput is by far the most important indicia of performance. At the same time, a more expansive quality of service definition is useful to reflect the growth in number, type, and nature of applications and the stress these are placing on network capacity. Thus, other factors, including latency and jitter, should be factored into the overall definition. These factors and how they should be weighed are discussed further below.

b. Single versus Multiple Definitions – In these comments, the FTTH Council proposes a multi-tiered definition of broadband that distinguishes between fixed and mobile service. It believes such an approach will facilitate user comparison of various service providers. The recommendation to construct a tiered approach is based on the need to provide policy benchmarks for the Commission and performance benchmarks for users, applications providers, and service providers. As for the distinction between broadband delivered by fixed and mobile access infrastructure service, the current characteristics and capabilities of the two architectures, while somewhat similar, are sufficiently different that comparisons between the two cannot be made with any precision. In particular, no one has yet to develop an objective measurement for the value of mobility, let alone a methodology to weigh such a value against other broadband performance indicia. The FTTH Council elaborates on its definition and distinctions in the sections that follow.

c. Application-Based Approach – The FTTH Council believes the Commission should use a combined “Supply” or provider-based approach with a “Demand” or application-based approach in constructing tiers of broadband service. The former has the advantage of reflecting the current provision of service while the latter will indicate future needs of users. More

specifically, for assessing near-term broadband capabilities, the Commission should examine broadband services that are actually being provided to construct tiers for current generation broadband offerings -- minimum, average, and maximum. To determine longer-term broadband needs, the Commission should examine the broadband capabilities that future (5 years out) applications will require. Support for this position can be found in numerous comments filed in response to the *NBP Notice of Inquiry*, including by Steve Perlman of Founder, CEO and CTO of Onlive, Inc., a new entrant offering video gaming and on-demand applications through cloud computing:

“Thus the FCC should remain focused on the most important element at this juncture – establishing a fundamental approach that is not nearsighted as it accomplishes availability goals, but that also takes into account future developments and needs that service applications will place upon a broadband network...the FCC must set its sights high to make way for future expansion and development of technologies.”⁴

Information about these future applications can be gleaned from publications and discussions with academics and industry representatives, and the Commission can ensure it has sufficient information by seeking public input.⁵

d. Key Characteristics and Specific Performance Indicators – The FTTH Council

believes that downstream and upstream throughput are essential determinants of broadband capabilities, and, in all-fiber networks, with their enormous symmetrical throughput, they are by far the most important determinants of capability. In addition, throughput is sufficient to evaluate the network demands of most current applications – that is those that transmit primarily

⁴ Reply Comments of Onlive, Inc., GN Docket No. 09-51, July 21, 2009 at 7, available at: http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=7019917673. (“Onlive Reply Comments”)

in one direction and do not require immediate responses. However, particularly in networks that are not all-fiber, because applications requiring two-way transmission and rapid responses/feedback are placing greater demands on network providers to balance capacity and traffic to provide acceptable performance, users are increasingly seeking additional broadband performance indicia, including: latency, packet loss, jitter, and contention. With more traffic in digital form and IP format, common references and definitions of measurements are in place for these indicia. The Council therefore believes that Commission should seek a standardized measurement of these additional characteristics and indicia from service providers to form an overall set of Quality of Service (QoS) metrics for broadband – with one major proviso: before requiring the collection and submission of such data, the Commission should inquire from service providers about the ability and cost to make such measurements, especially from smaller entities.

e. Measurement of Segments of the Network – For users, overall (end-to-end) network performance is crucial and hence must be measured. At the same time, for the Commission's policy purposes, it is important to examine broadband performance data both for the access infrastructure (the nearest point of aggregation or switching to the user) and the transport infrastructure (from this point of aggregation to the internet node). Measurement on a "per user" basis for the access link is relatively straightforward, although, as explained below, the Commission needs to account for differences in access technology. While it would be useful to measure from the middle mile connection to backbone systems, because these facilities are not

⁵ The Commission in fact has undertaken this type of examination in the August 27, 2009 Broadband Workshop, "Technology – Applications and Devices." *See*, http://www.broadband.gov/docs/ws_tech_applications/ws_tech_applications.doc.

dedicated, the Commission should understand that it will need to construct a different (not a “per user”) statistic and should seek further comment on that measurement.

f. Weighing Characteristics and Performance Indicators -- As noted above, when traffic is a small fraction of capacity, concerns about latency, packet loss, jitter, and contention are minimized. Thus, in all-fiber networks with minimal splitting, the throughput is so great that network managers pay less attention to latency, jitter, and other concerns than if they were overseeing traffic in less robust networks. It is for that reason that throughput should be the preeminent concern in determining broadband performance. Throughput (availability) should be measured at peak traffic periods using statistically significant methods. As for other factors, any weighting depends on the demands of specific applications, and the FTTH Council suggests that the Commission gather additional information and conduct further analysis prior to determining the weights accorded to them.

g. Technological Distinctions – The FTTH Council does not believe that the underlying capabilities of wireline and wireless networks are *per se* so different so as not to be comparable. At the same time, as discussed above, the access link for mobile networks – where there is a trade-off between mobility and performance (*e.g.* throughput) -- is sufficiently different from last-mile infrastructure for fixed networks that broadband capabilities for each should be measured and benchmarked separately. This view is reinforced by the fact that applications are increasingly being customized based on whether the network is fixed (higher throughput) or mobile (locations-based capabilities).

h. Feasibility and Verifiability of Measurements – First, prior to expanding the type of data collected, the Commission should seek industry input to obtain insight on the precise measurements to make and to ensure no undue burdens are imposed. In general, it is feasible to

measure the characteristics and performance indicators discussed herein. However, it is important to note that in all-fiber networks, with dedicated links to each customer, these measurements will provide a purer description of network capability, that is, the measurements will not vary by usage. That is not the case with current cable networks, where there is shared bandwidth at the hub, and in mobile networks, where performance can vary based on number of users in a cell, the applications being used, and the degree of spectrum interference. The Commission, therefore, needs to ensure its measurement process and its analysis account for this differential to ensure benchmark comparisons have validity.

In general, to permit comparisons among broadband service providers and to assess them against benchmarks, the Commission should establish standards for data collection and submission. The FTTH Council believes that service providers should measure broadband performance at peak traffic periods for a specific duration in a month and repeat these measurements quarterly. Reports should be filed annually as part of the Form 477 process. Finally, to ensure that the Commission collects the best and most relevant data, it should annually review the state-of-the-art on its indicia and measurements and regularly update any guidance for the industry.

2. Thresholds

The definition of broadband is relevant because it serves as a basis for an array of policy actions by the Commission and because it provides benchmarks for users, applications providers, and service providers to determine the price and quality of services that are being offered. The flaws with the Commission's pre-2008, simplistic definition – broadband includes every internet access service with bandwidth of more than 200 kbps – are twofold. First, the definition served only one of many policy aims -- to ensure all users received a minimal level of service (the

problem of “unserved” users) – and it was no help to users seeking more than this minimum. As a result, the Commission effectively ignored other important objectives, including the needs of underserved users or those of users demanding higher-quality service, and it gave most users no ability to benchmark offerings since they were subscribing to broadband services with performance far above this minimal level. The second major problem with the definition is that it did not distinguish between broadband provided over the much different fixed and mobile access infrastructures.

In last year’s order expanding its data collection for broadband services,⁶ the Commission began to remedy these problems by requiring providers to submit data based on a series of broadband “speed” tiers. The FTTH Council believes the Commission should build on this decision in creating a tiered definition of broadband that is easily understandable, can evolve over time, and is relevant for purposes of policy determinations. To that end, the Council proposes a four tier definition of broadband: current generation tiers for minimum, average (or most widely used), and maximum (highest performance) service offerings and a fourth tier for future generation services.

While the Commission should move to base thresholds for the current generation tiers on actual performance and all indicia of such performance, the FTTH Council proposes that the initial definition, which will be employed in the National Broadband Plan, be based on information currently available, that is, advertised performance, speed tests, and other available

⁶ *In the Matter of Development of National Broadband Data to Evaluate Reasonable and Timely Deployment of Advanced Services to All Americans, Improvement of Wireless Broadband Subscribership Data, and Development of Data on Interconnected Voice over Internet Protocol (VoIP) Subscribership*, Report and Order and Further Notice of Proposed Rulemaking, WC Docket No. 07-38, Rel. June 12, 2008.

data largely related to throughput and to a lesser extent other factors.⁷ By examining these data, the Commission can establish tiers that accurately reflect today's minimal, average, and maximum broadband service offerings.

To determine current fixed broadband network performance as measured only by throughput, the FTTH Council asked the consulting firm, CSMG, to examine market data of advertised throughput in major markets, offered throughput in major markets, analyst and consumer surveys of advertised throughput, actual throughput, and international comparisons. These data are included in the appendix to these comments. From the data available, CSMG constructed a proposed tiered structure for fixed broadband services reflecting current market conditions. As the FTTH Council noted earlier in these comments, the Commission should construct a similar chart for the provision of broadband over mobile access infrastructure.

⁷ The FTTH Council supplied extensive information about these indicia in its Comments and Reply Comments in the *NBP Notice of Inquiry*. See, http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520220547 and http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=7019917533.

CURRENT GENERATION BROADBAND TIER	UPLOAD SPEED ⁸	DOWNLOAD SPEED
MINIMUM	384 Kbps ⁹	768 Kbps ¹⁰
AVERAGE	1.7 Mbps ¹¹	9.1 Mbps ¹²
MAXIMUM	20 Mbps	101 Mbps

As indicated above, the FTTH Council believes the Commission should establish a final, “future generation” tier to drive its policy goals. This fourth tier would be demand-driven, based upon an examination of the best available information about applications likely to be offered within the next five years. Applications of particular relevance include the overall trend towards the use of interactive cloud computing¹³ and those that facilitate the development and use of technologies that will benefit the economy (increased worker productivity and availability),

⁸ While the chart defines performance only in terms of throughput, the FTTH Council, as noted in these comments, expects that future charts would include other QoS metrics.

⁹ Minimum and Maximum tier advertised upload speeds are from the lowest and highest offers currently available in the top 10 U.S. cities (by population). The highest advertised Maximum tier upload speed (20 Mbps) is currently offered by Verizon FiOS in multiple U.S. markets. The lowest upload speed (384 Kbps) is offered by AT&T and Verizon in 9 of the top 10 U.S. markets.

¹⁰ Minimum and Maximum tier advertised download speeds are from the lowest and highest offers currently available in the top 10 U.S. cities (by population). The highest advertised Maximum tier download speed (101 Mbps) is currently offered by Cablevision in New York City. It is estimated that other cable companies will match or exceed this offer in the near future. Verizon FiOS is expected to generally exceed highest cable speeds. The lowest download speed (768 Kbps) is offered by AT&T in 6 of the top 10 U.S. markets.

¹¹ Average tier upload speeds are estimated using the most prevalent upload speeds accompanying download speed offers of ~9 Mbps (*see* n. 12) in currently marketed offers in the top 10 U.S. markets.

¹² Average tier download speeds are calculated by taking a weighted average of the current (2009) distribution of U.S. broadband subscribers by speed tiers, as estimated in the SNL Kagan Report (*see*, SNL Kagan website, *Economics of the Internet Media 2009*).

¹³ *See, e.g. Online Reply Comments.*

healthcare (telemedicine), education (distance learning), and the environment (telecommuting), as well as those that enhance international competitiveness, foster social interaction, and enhance entertainment experiences. The Commission gathered information about such applications at recent workshops,¹⁴ and the FTTH Council intends to provide in future submissions information on performance benchmarks for that tier.

3. Updates


As the Commission notes in the *Commission Notice*, any definition of broadband should reflect the rapidly evolving nature of the internet and broadband service offerings. As discussed above, the Commission should amend its Form 477 to collect and report annually data on the broadband characteristics and performance indicia discussed herein. These data and the Commission's analysis of that information should be used to update the three broadband tiers of the chart proposed in the Thresholds Section. In addition, the Commission should issue annually a notice to (1) examine the future network performance requirements in light of developing applications, which will provide support for performance criteria in a fourth, Future Generation, tier, and (2) inquire about the need to alter its methodology for defining broadband.

Finally, the Commission inquires about the effect of an evolving definition on the gathering of data about deployment and adoption. In responding to this inquiry, it is first important to note that because the Commission relied so long on a completely outdated definition of broadband – 200 kbps – its data had no real value and its policies that flowed from use of such

¹⁴ See, e.g. the FCC Broadband Workshop presentations on Aug. 27, 2009: *Connecting Globally via TelePresence*, D. Hsieh, VP Marketing, Cisco, available at: http://www.broadband.gov/docs/ws_tech_applications/ws_tech_applications_hsieh.pdf; *Unleashing the Potential of Tomorrow's Applications and Devices*. A. Gupta, Microsoft, available at: http://www.broadband.gov/docs/ws_tech_applications/ws_tech_applications_gupta.pdf.

data were deeply flawed. The Commission has an obligation to report accurately on the broadband marketplace. Because the market is driving more demanding applications and investment in higher performing broadband services, the Commission has no choice but to track those trends accurately and reflect them in the definition of broadband. Following the same rationale, the Commission needs to ensure that its tracking of deployment and adoption also reflects current market realities. While this imposes a greater burden on the Commission and its resources, it is essential to maintain the integrity of the process. In sum, the Commission has a tremendous opportunity with the National Broadband Plan to adopt fundamental and relevant methodologies that will guide the development and implementation of broadband policies for years to come. The FTTH Council stands ready to assist it in achieving that objective.

Respectfully submitted,



Thomas W. Cohen
KELLEY DRYE & WARREN LLP
3050 K Street NW, Suite 400
Washington, D.C. 20007
(202) 342-8518 (telephone)
(202) 342-8451 (facsimile)
TCohen@kelleydrye.com

Counsel to the Fiber-to-the-Home Council

APPENDIX



National Broadband Plan Targeted Research

Prepared for: **FTTH Council**

August 31th, 2009

"We Make Strategy Work"

CSMG has conducted brief research to support the FTTH Council's comment to the FCC on the definition of "broadband" in the upcoming National Broadband Plan

CSMG Activities

- CSMG will support the FTTH Council by conducting the following research and analysis
- Current Advertised Rates
 - For the top 10 US markets, collection of advertised speeds across all tiers from ILECs and MSOs
- Average National Advertised Rates
 - Estimation of average advertised speed used by US consumers, based on published sources
- Average Rates of Throughput
 - Collection of data on achieved broadband speeds, based on speed tests and other surveys from CSMG and public sources

Our research and analysis is based on the specific sources and methodologies detailed below

Research Sources and Methods

	Definition	Sources Consulted	Methods Used
Minimum (Basic) Tier	Lowest broadband speed currently commercially available (both advertised and achieved) in competitive markets	<ul style="list-style-type: none"> • Service provider online and phone sales channels • General and trade press • Industry news sites and blogs • Online speed tests conducted by CSMG 	<ul style="list-style-type: none"> • Survey of the major wireline broadband providers (ILEC and MSO) in each of the 10 largest US cities by population • Collection of advertised speed tiers as of August 24-28, 2009 • Achieved speeds estimated using the ratio of average US speeds delivered/measured (Akamai report) as a percentage of the average US advertised speeds (SNL Kagan)
Current Generation Average	US average broadband speed used by consumers (both advertised and achieved speeds)	<ul style="list-style-type: none"> • Analyst surveys and estimates: SNL Kagan (2009), IDC (2008) • Service provider online and phone sales channels • Published studies of speed tests: Akamai (2009), CWA (2009) 	<ul style="list-style-type: none"> • CSMG analysis of analyst estimates of US broadband subscriber distributions by download speed tier • Upload speed estimated from the prevailing advertised download/upload speed currently available in the 10 largest US markets • Average achieved speeds as reported by Akamai in a Q1'09 report (The State of the Internet)
Next Generation Tier	Fastest broadband speeds currently available (both advertised and achieved) in competitive markets	<ul style="list-style-type: none"> • Service provider online and phone sales channels • General and trade press • Industry news sites and blogs • Online speed tests conducted by CSMG • Published studies: OECD (2008) 	<ul style="list-style-type: none"> • Survey of the major wireline broadband providers (ILEC and MSO) in each of the 10 largest US cities by population • Collection of advertised speed tiers as of August 24-28, 2009 • Achieved speeds estimated using the ratio of average US speeds delivered/measured (Akamai report) as a percentage of the average US advertised speeds (SNL Kagan)

Source : SNL Kagan – Economics of Internet Media 2009, Akamai – The State of the Internet 2009, IDC 2008 US Consumer Panel Broadband Survey, CWA – Speed Matters (2009); OECD Broadband Survey; CSMG analysis

Following the approach we mutually developed and drawing from the latest available research leads us to recommend these speed tier values

Broadband Speed Tier Recommendations

	Advertised Download Speed (Mbps)	Advertised Upload Speed (Mbps)	Achieved Download Speed (Mbps)
Minimum (Basic) Tier	0.768 ¹	0.384 ²	0.355 ⁵
Current Generation Average	9.1 ³	1.7 ⁴	4.2 ⁶
Next Generation Tier	101 ¹	20 ²	47 ⁵

Notes :

1. Minimum and Next Generation tier advertised download speeds are from the lowest and highest offers currently available in the top 10 US cities (by population). The highest advertised Next Generation Tier download speed (101 Mbps) is currently offered by Cablevision in New York City. We estimate that other cable companies will match or exceed this offer in the near future. Verizon FiOS is expected to generally exceed highest cable speeds. The lowest download speed (0.768 kbps) is offered by AT&T in 6 of the top 10 US markets.
2. Minimum and Next Generation tier advertised upload speeds are from the lowest and highest offers currently available in the top 10 US cities (by population). The highest advertised Next Generation Tier upload speed (20 Mbps) is currently offered by Verizon FiOS in multiple US markets. The lowest upload speed (0.384 kbps) is offered by AT&T and Verizon in 9 of the top 10 US markets.
3. Current Generation Average download speeds calculated by taking a weighted average of the current (2009) distribution of US broadband subscribers by speed tiers, as estimated in the SNL Kagan report.
4. Current Generation Average upload speeds estimated using the most prevalent upload speeds accompanying download speed offers of ~9Mbps (see note 3) in currently marketed offers in the top 10 US cities
5. Achieved download speed for the Minimum and Next Generation tiers calculated by using the ratio of US realized broadband speeds (Akamai) to those advertised (SNL Kagan). Average advertised download speeds estimated by a weighted average of subscriber distribution across speed tiers in the SNL Kagan report - the mid point of each speed tier range being used in the calculation.
6. Achieved download speed for the Current Generation Average tier sourced from the Akamai report.

Source : Company websites, SNL Kagan – Economics of Internet Media 2009, Akamai – The State of the Internet 2009, CSMG analysis

Broadband speed tiers currently advertised in the top 10 US markets

Broadband Service Provider	Markets	Advertised Speeds (Mbps) - download/upload		
		Lowest (download/upload)	Highest (download/upload)	Most common tier across providers
Verizon	New York City, Los Angeles, Philadelphia	1 / 0.384	50 / 20	1/1.5 download and 0.384 upload
AT&T	Chicago, Houston, Dallas, San Antonio, San Diego, San Jose	0.768 / 0.384	18 / 3	
Comcast	Chicago, Houston, Philadelphia, San Jose	1 / 0.384	50 / 10	
Time Warner Cable	New York City, Los Angeles, San Diego, Dallas, San Antonio	10 / 0.512	15 / 0.768	
Cablevision	New York City	15 / 2	101/15	
Qwest	Phoenix	1.5 / 0.896	5 / 0.896	
Cox Communications	Phoenix	13 / 1	28 / 2.5	
OVERALL		0.768 / 0.384	101 / 20	

Notes :

- Survey of the major wireline broadband providers (ILEC and MSO) in each of the 10 largest US cities by population.
- Collection of advertised speed tiers as of August 24-28, 2009

Source: Company websites, CSMG analysis

Broadband tiers currently available in the top 10 US markets

Currently Marketed Broadband Tiers in Top 10 US Markets

Top 10 US Markets	LOWEST		MIDDLE TIERS								HIGHEST		Internet Provider
	DL	UL	DL	UL	DL	UL	DL	UL	DL	UL	DL	UL	
New York City													
Telco	1,000	384	3,000	768			15,000	5,000	25,000	15,000	50,000	20,000	Verizon
MSO	10,000	512									15,000	768	Time Warner Cable
MSO	15,000	2,000	30,000	5,000							101,000	15,000	Cable Vision
Los Angeles													
Telco	1,000	384	3,000	768	7,100	768	15,000	5,000	25,000	15,000	50,000	20,000	Verizon
MSO	10,000	512									15,000	768	Time Warner Cable
Chicago													
Telco	768	384	1,500	384	3,000	512					6,000	768	AT&T
MSO	1,000	384	15,000	3,000	20,000	4,000	30,000	7,000			50,000	10,000	Comcast
Houston													
Telco	768	384	1,500	384	3,000	512					6,000	768	AT&T
MSO	12,000	2,000									16,000	2,000	Comcast
Phoenix													
Telco	1,500	896									5,000	896	Qwest
MSO	13,000	1,000	20,000	2,000							28,000	2,500	Cox
Philadelphia													
Telco	1,000	384									3,000	768	Verizon
MSO	1,000	384	15,000	3,000	20,000	4,000	30,000	7,000			50,000	10,000	Comcast
San Antonio													
Telco	768	384	1,500	384	3,000	512					6,000	768	AT&T
MSO	10,000	512									15,000	768	Time Warner Cable
Dallas													
Telco	768	384	1,500	384	3,000	512	6,000	768	12,000	3,000	18,000	3,000	AT&T
MSO	10,000	512									15,000	768	Time Warner Cable
San Diego													
Telco	768	384	1,500	384	3,000	512	6,000	768	12,000	3,000	18,000	3,000	AT&T
MSO	10,000	512									15,000	768	Time Warner Cable
San Jose													
Telco	768	384	1,500	384	3,000	512	6,000	768	12,000	3,000	18,000	3,000	AT&T
MSO	1,000	384	15,000	3,000	20,000	4,000	30,000	7,000			50,000	10,000	Comcast

 Verizon FiOS

 AT&T U-Verse

Notes :

- Survey of the major wireline broadband providers (ILEC and MSO) in each of the 10 largest US cities by population.
- Collection of advertised speed tiers as of August 24-28, 2009

Source: Company websites and telesales

Advertised broadband speeds in the US – Analyst estimates

Speeds Advertised

Analyst Estimate

2009 US BROADBAND SUBSCRIBERS BY DOWNLOAD SPEED TIER			
Speed Tier	Download Speed (Mbps)	Upload Speed (Mbps) ¹	% Total Subscribers
MINIMAL	0.768-1.5	0.384	24%
CURRENT	1.5-7	0.384 - 0.768	31%
	7-20	0.768 - 4	32%
FUTURE	20-30	4 - 7	13%
AVERAGE ²	9.1	1.7	

Source : SNL Kagan – Economics of Internet Media 2009

Notes :

- CSMG estimate of upload speed tier based on the most prevalent upload speeds accompanying the download speed tiers in the SNL Kagan report (uses currently marketed products in the top 10 US cities)
- Average download and upload speeds estimated by a weighted average of subscriber distribution across speed tiers; the mid point of each speed tier range being used in the calculation

Source: SNL Kagan, IDC, CSMG analysis

Broadband speeds in the US –Realized

Speeds Realized

REALIZED SPEEDS BY DOWNLOAD SPEED TIER - source 1		
Download Speed (Mbps)	Upload Speed (Mbps)	% Total Users
< 2	< 0.384	37%
2-5	0.384 - 0.768	37%
5-10	0.768 - 3	21%
10-15	3-5	3%
> 15	>5	2%

Source : Akamai – The State of the Internet 2009

REALIZED SPEEDS BY DOWNLOAD SPEED TIER - source 2		
Download Speed (Mbps)	Upload Speed (Mbps)	% Total Users Surveyed
< 0.768	< 0.384	18%
0.768 - 6	0.384 - 0.768	51%
6 - 10	0.768 - 3	13%
10 - 25	3 - 15	17%
> 25	>15	2%

Source : CWA – Speed Matters (2009)

N = 413,814

Note : CSMG estimate of upload speed tier based on the most prevalent upload speeds accompanying the download speed tiers in the Akamai and CWA reports (uses currently marketed products in the top 10 US cities)